

For polymers whose skeleton consists of DMAM, ultrafiltration was used according to the following procedure:

5 The reaction medium is diluted in one litre of water and then ultrafiltered on a membrane whose cut-off is 100 000 Daltons. The solution of polymer is then concentrated and then freeze-dried.

10 The yield is quite variable, generally around 60%.

The macromolecules with an acrylamide skeleton are precipitated from acetone according to the following procedure:

15 The reaction medium is slowly precipitated from 1 litre of acetone and then filtered on No. 4 sintered glass and washed with three times 100 ml of acetone. The solid is recovered and then dried overnight using a
20 slide vane rotary vacuum pump.

The mass yield is much higher than for ultrafiltration-freeze-drying and is close to 90%.

25 The level of incorporation of the macromolecules was checked by proton NMR on the polymers diluted to 2 g/100 ml in heavy water (Bruker apparatus at 250 and 400 MHz). It is found that the incorporation level depends only, except for experimental fluctuations, on
30 the ratio between the initial mass of PNIPAM and the initial mass of hydrophilic monomer. It is $6.5 \pm 0.3\%$ by mole, for an initial concentration of 0.4 g of PNIPAM per 2.8 g of acrylamide, and $12 \pm 1\%$ by mole, for an initial concentration of 0.8 g of PNIPAM per
35 2.8 g of acrylamide, respectively.

EXAMPLE 3:

Evaluation of the rheological behaviour of DMAM/PNIPAM and AM/PNIPAM copolymers prepared according to Example 2 as a function of the temperature.

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In this example, each of the copolymers was introduced in an amount of 5 g/100 ml into purified water (MilliQ). The viscosity of each of the corresponding solutions was measured on a Brookfield DV3 cone-plate
10 rheometer controlled by the Rheocalc software (Sodexim, Muizon, F). The shear rate selected is 10 (1/s) for a temperature gradient of 1°C per minute. The results obtained are represented in Figure 1.

15 It can be observed that the various copolymers synthesized indeed exhibit the rheological properties which make it possible to use them according to the invention, and in particular, that they exhibit a viscosity V2 at a temperature T2 which is significantly
20 higher, by a factor greater than 2 (100%), often of the order of 10, and which may be up to a factor of 60, than the viscosity V1 obtained at a temperature T1 which is less than T2 by at least 20°.

25 For the polymers described in this example, the temperature T1 may be between 20 and 40°C, or even less, and the temperature T2 may be greater than 45°, and preferably of the order of 60°C.

30 It is also observed that the polymer T10AA, prepared as a control according to the same protocol but without PNIPAM macromonomer, and which cannot therefore have in its structure the multiplicity of blocks with LCST which characterizes the copolymers according to the
35 invention, exhibits a viscosity which decreases weakly and continuously as a function of the temperature, and cannot therefore exert the beneficial effects of the invention.

Moreover, for all the copolymers and at a rate of change in temperature of 1°C per min, no significant hysteresis is observed, the viscosity curve being essentially identical when the temperature rises or decreases.

By comparing Figure 1 and Table 2, it is noted that the viscosity at low temperature is highly correlated with the molecular mass of the copolymer. It is also observed that the thermoviscosifying behaviour and the increase in viscosity with temperature are highly correlated with the average number of segments with LCST per chain N_s , the highest values for this parameter corresponding to the highest thermoviscosifying effects.

Figure 2a illustrates the rheological behaviour of the copolymer T10 in an ionic electrolyte such as for example potassium carbonate, or alternatively a buffer of the TRIS-TAPS 50 mM/Urea 7M type as used for the sequencing.

In Figure 2b, there are represented the behaviours of two solutions based on the copolymer PAM-NIPAM T10, one for a concentration of 3 g/100 ml of copolymer and the other for a concentration of 2 g/100 ml of copolymer. It is noted that the thermothickening character is sensitive from 2 g/100 ml, but is reinforced at 3 g/100 ml and even more at 5 g/100 ml (Figure 1), the concentration also being a parameter which will be varied in a useful manner in order to adapt the media according to the invention according to the particular applications.

In particular, most of the polymers presented in Table 2 exhibit, for concentrations of less than or equal to 5 g/100 ml, a thermoviscosifying character, that is to say that they do not exhibit significant hysteresis of their viscosity as the temperature rises